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Is it Time to Consider Body Mass Index to be Bad Medical Information (BMI)?

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Abstract

Excess body weight is, in itself, not a disease that requires intervention. When excess weight negatively impacts health, only then should reduction of excess weight become medically indicated. Body Mass Index (BMI) has been the sole defining measure of obesity and consequently the risk for Cardiometabolic Disorders (CMDs) associated with excess body fat. However, BMI carries numerous limitations that could cause false reassurance to those with a normal BMI and unnecessary anxiety or needless interventions to those with an increased BMI. The authors propose revisiting the utilization of BMI in medical practice, including the removal of BMI values from the definition of obesity. We also propose a simple classification of obesity based on body shape. Finally, we advocate for renaming the patient-insensitive terms "Obese" and "Obesity".

Introduction

Body Mass Index (BMI) was first introduced by the Belgian mathematician, Adolph Quetelet, in 1832 for the statistical purpose of studying populations. BMI is a formula of the total body weight (in kilograms) divided by height squared (in meters) [1]. BMI was initially called Quetelet's Index and was never intended as a quantitative measure of body fat nor human health [1]. It was not until the mid-twentieth century that BMI was incorporated into medicine,, by international organizations including the World Health Organization (WHO)[2]. The utilization of BMI as the sole measure of obesity and obesity-related disorders carries numerous limitations, most significantly in a large section of falsely diagnosed obese-but-healthy people and an equally large section of people with CMDs lurking under the false premise of normal BMI. The authors describe BMI as bad medical information for the following reasons:

Bodyweight Composition Bias

BMI is incapable of differentiating between the weight of the different body structures, such as fat, bone, muscles, and fluid. As a result, the BMI of a healthy muscular person could be the same as, or higher, than that of an ill obese person.

Adipose Tissue Distribution Bias

In 1947, Dr. Jean Vague was the first to introduce the associations between fat distribution phenotype and health. They described the android body type as having an increased risk related to the development of CMDs, when compared with the gynecoid body, even at the same BMI [3]. The authors of the current paper are proposing a simple obesity classification based on Dr. Vague's description of body shapes and fat distribution (Figure 1).

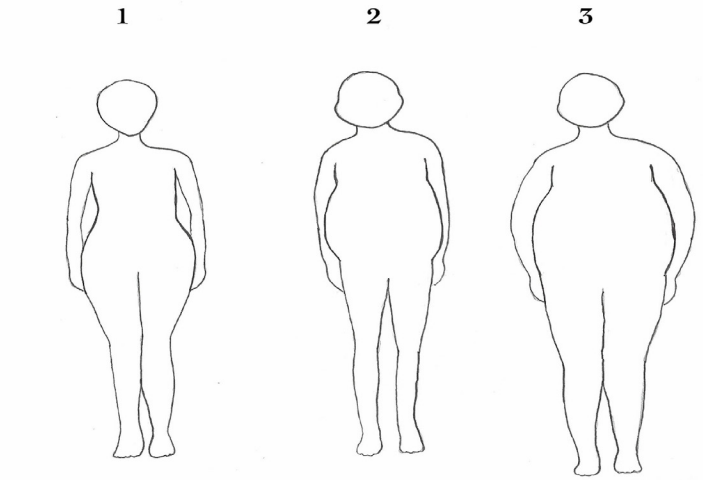

Figure 1: Hypothetical body shapes according to Dr. Vague.

BMI value does not consider the nature of the excess fat. Subcutaneous Adipose Tissue (SAT) is not only harmless but could also be cardio-protective compared with Visceral Adipose Tissue (VAT). Several studies report that the lower ratio between VAT and SAT, the lower the risk of CMDs [4]. A 201 measured the ratio of VAT and SAT via CT scan . The researchers found that, as the VAT-SAT ratio increased, so too did the risk of CMDs [4]. Normalizing

the elevated BMI values became the target of obesity treatment to reduce the medical risk associated with high BMI. However, when surgeons performed large volume liposuctions (20-40% of excess body fat), mostly from the midsection, they noted no improvement of CMD risk or metabolic profile [5]. This suggests that reduction of the total fat mass does not reduce the individual risk of CMDs. At the same time, several studies have shown associations between BMI, other measures of adiposity (such as waist circumference), and CMD risk, as well as increased risk of cardiovascular disease. This area of research requires further investigation and clarification so that evidence-based public health programs can be developed, and health care professionals can effectively support their patients to make decisions about their weight.

Height Bias

Height is not a risk factor for, nor protects against, CMDs. However, adding height into the BMI formula could falsely "dilute" excess weight in tall individuals. While being short could exaggerate a normal weight towards being classified as obese.

Gender Bias

Men and women differ metabolically, hormonally, and genetically. That leads to a vast difference in their own risk of developing CMDs regardless of the BMI.

Racial Bias

BMI differs according to race. For example, Asian populations are considered obese at a lower BMI when compared with White or Black populations.

Age Bias

BMI does not address obesity duration or the age of onset, both factors that could impact CMDs risk. Exposure to a lower BMI for a long duration could be more detrimental to health than the new onset of a higher BMI. Age bias is more prominent in females. A premenopausal female in her forties with a BMI of 30 will have a significantly lower risk of CMDs than she would with the same BMI when postmenopausal. Above 65 years of age, the association between all-cause mortality and BMI was found to be U-shaped with the lowest mortality in those considered overweight between 24.0 and 31 and the highest mortality when BMI is lower than 23 or indicative of obesity [6].

Discussion

BMI is a convenient and non-invasive measure of body weight. The utilization of BMI in medicine carries multiple limitations that patients and healthcare providers should be aware of when interpreting BMI values. Waist Circumference (WC) and Waist-To-Hip Ratio (WHR) were introduced to overcome some of the limitations of BMI. Additionally, when BMI values were compared with Waist Circumference (WC) and Waist-To-Hip Ratio (WHR) in patients with cardiometabolic disorders, BMI was the least associated parameter to either health or disease, while WHR was the most accurate [7]. Furthermore, among cardiac patients with normal BMI, there was an increased risk for in-hospital complications, cardiac death, and one-year mortality when compared with obese cardiac patients, giving rise to the "obesity paradox" phenomenon [8]. Statistically, one-third of individuals with an increased BMI have a completely healthy metabolism [9]. It serves no purpose to cause such a large population unnecessary anxiety or lead them to undergo any weight loss intervention which could trigger body image dissatisfaction and potential eating disorders in an attempt to normalize what is already normal. While one-third of individuals with normal BMI have at least one CMDs giving rise to the state of normal-weight obesity [9]. Cardiometabolic disorders could rightly be related to body fat and its location, thus, the authors of the current paper suggest renaming the "Obesity Paradox" the "BMI Paradox".

Notably, obesity is poorly defined and further research is needed to find a convenient yet accurate method, until then WHR appears to be the most accurate method. Total body weight and BMI should be separated from the risk of CMDs. A new definition and classification, based on health risk, is warranted. The authors suggest renaming obesity as adiposis and a simple classification (Table 1) based on body shape and excess fat distribution (Figure 1). A normal BMI has the potential to cause false reassurance, while an increased BMI might cause needless anxiety. The authors call on sending the 200-year-old statistical formula of BMI to where it belongs, the museum of the history of medicine. At the same time, the term obese and obesity are perceived as derogatory by the public and there is, therefore, a need to change the nomenclature to more patient-sensitive vocabulary [10]. Other phrases have been assigned to the history books when they become unpalatable to the majority.

	1	2	3
Terminology	External adiposis	Internal adiposis	Mixed adiposis
CMDs risk	Low	High	Intermediate
Location	Hips & thighs	Abdomen & face	Both
Body shape	Gynecoid	Android	Combined

Table 1: Adiposis Classification.

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